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Preliminary Report RRD24MR002

*This information is preliminary and subject to change.*

# Chicago Transit Authority Yellow Line Train Collision with Snow Removal Machine

Chicago, Illinois  
November 16, 2023

On November 16, 2023, about 10:30 a.m. local time, southbound Chicago Transit Authority (CTA) Yellow Line passenger train (run 593) collided with a stationary CTA snow removal machine (S-500) on south Skokie track 1 and derailed.<sup>1</sup> (See figure.) The train was carrying 1 operator and 30 passengers. There were six CTA employees on board the snow removal machine. Sixteen people were transported to a hospital, treated, and released. Three people were critically injured. There were no fatalities. The train remained upright following the collision. CTA estimated damages to equipment to be about \$8.7 million. At the time of the accident, visibility conditions were daylight and clear; the weather was 61°F with no precipitation.

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<sup>1</sup> The *snow removal machine (S-500)* was purchased by CTA from Mitsubishi International Corporation in 1981. The machine was rail-bound, meaning it operated over track. The machine removed snow with a front-mounted auger and a rear-mounted brush.



**Figure.** Accident site.

The track at the accident site is double main track. Train movements are authorized by wayside and in-cab signal indications with an overlaid automatic train control system and coordinated from a rail operations control center.<sup>2</sup> The signal system at the accident location is configured to allow a stopping distance of 1,780 feet or less. The maximum authorized speed was 55 mph, as set by CTA instructions.

The passenger train consisted of two 5000-series heavy rail transit vehicles (railcars) built by Bombardier Transportation in 2014. The railcars were designed to meet CTA's braking specifications, meaning the deceleration rate, or brake rate, for a full service braking application was about 4.1 feet per second squared under ideal conditions.<sup>3</sup> The railcars were equipped with three types of brake systems: dynamic brakes, friction brakes, and magnetic track brakes.<sup>4</sup> All brake systems can be activated by the train's operator or by the automatic train control system if an

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<sup>2</sup> An *automatic train control system* enforces speed limits and protects equipment and train separation by preventing movement through a signal or location that requires a stop.

<sup>3</sup> A *full service braking application* is the strongest normal application of a train's brakes.

<sup>4</sup> *Dynamic brakes* use a railcar's traction motors to slow the railcar wheels; most braking applications above about 5 mph use dynamic brakes. *Friction brakes* use discs and calipers to brake the wheels. *Track brakes* apply braking force directly to the running rail.

operator does not respond appropriately to a signal indication. The 5000 series is also equipped with a wheel slide protection system.<sup>5</sup>

The passenger train was on a scheduled trip from Dempster-Skokie Station to Howard Station. The operator was aware that the snow removal machine was operating on the Yellow Line as part of a training exercise but did not know its exact location. Shortly before the collision, the southbound snow removal machine stopped about 370 feet north of a red signal indication.<sup>6</sup> The passenger train was traveling southbound about 54 mph when the operator received a stop command from the signal system because of the snow removal machine stopped on the track about 2,150 feet ahead. The operator immediately initiated a full service braking application to stop the train.<sup>7</sup> The operator then saw the snow removal machine and initiated an emergency braking application.<sup>8</sup> The train decelerated to about 27 mph before striking the snow removal machine. Preliminary review of the train's event recorder showed that the wheel slide protection system activated throughout both braking applications.

While on scene, National Transportation Safety Board (NTSB) investigators conducted sight distance observations, reviewed data from the train's event recorder as well as the inward- and outward-facing image recorders, reviewed communications from rail operations control, collected samples of organic material from the top surface of the rails at the accident site, and conducted interviews.<sup>9</sup>

The NTSB's investigation is ongoing. Future investigative activity will focus on the design and configuration of the CTA signal system, the design and braking performance of the railcars involved in the accident, and examination of organic material present on top of the running rails investigators collected to determine what impact, if any, this material had on the accident.

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<sup>5</sup> A *wheel slide protection system* improves braking performance by modulating braking effort to reduce wheel slide during braking. The 5000 series is not equipped with a sanding system, another means of reducing wheel slide.

<sup>6</sup> A *red signal indication* is a signal requiring a train or other equipment to come to a full stop.

<sup>7</sup> On 5000-series railcars, a full service braking application uses only the dynamic brakes until the train has decelerated to about 5 mph, then engages the friction brakes.

<sup>8</sup> An *emergency braking application* uses the maximum braking force available and is designed to stop a train as quickly as possible; on the railcars involved in this accident, an emergency braking application involves the dynamic, friction, and track brakes.

<sup>9</sup> *Organic material* can include leaf debris or other contaminants and can impact wheel adhesion during braking applications.

CTA has begun to examine its system and modify its operations. To date, CTA has reconfigured its signal system to reduce the maximum authorized speed on the Yellow Line from 55 mph to 35 mph, cleaned its Yellow Line track, inspected track at other locations with similar environmental characteristics, and issued bulletins to remind employees of best practices for operating trains under slippery conditions. CTA has also begun to modify its protocols for preventive track maintenance to better account for environmental considerations that could impact track conditions.

Parties to the investigation include the Federal Transit Administration, the Illinois Department of Transportation, CTA, the Amalgamated Transit Union Local 308, and the International Association of Machinists and Aerospace Workers (District 8).